

ularly designed for and is particularly adaptable to the molding of foam plastic, it is not confined thereto but may be utilized additionally for molding of conventional solid plastic materials, thus adding still further to its versatility.

While the foregoing apparatus has assumed the use of an extruder as the plasticating means, it will be recognized that other known plasticating devices may also be used. For example, the extrusion screw 18 could conceivably be replaced by a ram and torpedo combination whereby thermoplastic material in granular form with pressurized gas contained therein could be supplied to the chamber 17 ahead of a plasticating ram which could then drive the material with entrained gas therein past a torpedo for plasticating thereof. This however, while recognized as a possibility is believed, at least at present, to be less desirable in view of the greater difficulties of plasticating by use solely of a torpedo.

While a particular embodiment of the apparatus aspects of the invention has been chosen to illustrate both the method and apparatus aspects thereof, it will be recognized that the method of the invention may be practiced by a wide variety of other types of apparatus and the apparatus of the invention may be manifested in a variety of specific embodiments. Accordingly, the specific disclosures herein will be recognized as illustrative only and not limiting.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. The method of foaming a thermoplastic material comprising the steps:

introducing a quantity of said thermoplastic material in a granular form into a hopper above and communicating through an opening with a plasticating chamber containing a plasticating member consisting of an elongate member rotatable for downstream advancement and plasticating of the thermoplastic material and having an inlet end portion extending past said opening;

maintaining said hopper in communication with said plasticating chamber through said opening while otherwise closing said hopper against gas escape, and permitting said granules to lie loosely in said hopper and in said opening in an unsoftened state; supplying gas inert to the thermoplastic granules from an external high pressure gas source directly into said closed hopper without prior heating or mechanical compression of the granules and other than through said opening, and uniformly and rapidly penetrating the spaces between the thermoplastic granules lying in said hopper and said opening with said gas under pressure and wherein said gas under pressure is provided as the foaming agent;

preventing external gas entry directly into the plasticating chamber at any point downstream of said opening at all times, but permitting gas from said hopper to enter the plasticating chamber through said opening;

introducing said granules, still uniformly interspaced with said high pressure gas and prior to any heating or softening of such granules, into said plasticating chamber and engaging same by said plasticating member for subsequent downstream movement in the plasticating chamber by the plasticating member and while continuing connection of the high

pressure gas supply through said hopper and opening to said plasticating chamber;

initiating and continuing melting said granules in said plasticating chamber by heat generation therein by working and moving the thermoplastic material along the plasticating chamber by rotating of said plasticating member, while maintaining said gaseous pressure in said hopper and in the communicating portion of said plasticating chamber at a pressure substantially exceeding the pressure applied to the thermoplastic material by said plasticating member during melting, wherein said gas remains uniformly distributed throughout the material during said melting and upon the completion of said melting the resultant plastic material encases uniformly distributed separate bubbles of said high pressure gas.

2. The method of claim 1, including the further steps of:

imposing a low pressure onto said melted material, in which said bubbles are uniformly distributed, and divergently conducting portions thereof in response to said low pressure through a system of conduits to a plurality of injection assemblies, while positively preventing reverse flow of said material from an injection assembly to other said assemblies and said plasticating chamber;

accumulating a predetermined quantity of such plastic material in each of said injection assemblies; and

after said quantities are accumulated in all of said plurality of injection assemblies imposing on each a high pressure higher than the distribution pressure and driving same into a common mold.

3. The method of claim 1, including, as part of said reverse flow preventing, the step of isolating from the distribution system each injection unit when said quantity of plastic material is accumulated therein, whereby each injection unit can thereupon operate independently of each other injection unit.

4. The method of claim 1 including, prior to said granule to hopper introducing step, supplying a quantity of granular, thermoplastic material to an upper chamber above said hopper, said granule to hopper introducing step including shifting a valve into said hopper to drop a measured quantity of said granular material from said upper chamber into said hopper, closing said valve to close said hopper against subsequent high pressure gas leakage, and thereafter maintaining further granular thermoplastic material in said upper chamber.

5. The method of claim 4 including, following said granule to hopper introducing step, and where air may be harmful to the thermoplastic granules as during subsequent melting, ridding the hopper of atmospheric components, by connecting a vacuum source to the interior of said hopper and drawing out at least most of the air therewithin and thereafter closing said hopper to said vacuum source prior to said supplying of said high pressure gas and without heating said hopper.

6. The method of claim 4 including, substantially upon full delivery of the granular plastic material from the hopper to said plasticating member, reducing the gas pressure in said hopper to a low substantially atmospheric level to equalize hopper and upper chamber pressures and valving a new charge of granular material from said upper chamber into said hopper therebelow for repetition of the above sequence of steps.